

Application No. 10/779,552
Amendment dated March 21, 2005
Reply to Office Action dated October 20, 2004

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS

Claim 1 (currently amended): A process for producing an aromatic polyimide foam, which process comprises:

- (a) providing a first solution comprising one or more aromatic dianhydrides or derivatives of aromatic dianhydrides dissolved in one or more polar solvents, along with an effective amount of one or more blowing agents;
- (b) providing a second solution comprising one or more isocyanates;
- (c) mixing the first and second solutions at under ambient ~~temperature~~ conditions to produce an admixture;
- (d) allowing the admixture to foam to completion under ambient conditions to produce a foamed product; and
- (e) curing the foamed product.

Claim 2 (original): The process of claim 1, wherein step (e) comprises exposing the foamed product to high frequency electromagnetic radiation, whereby the foamed product is cured from the inside thereof outwardly, allowing evolution of volatiles from interior areas of the foamed product, instead of entrapment of the volatiles therein by an outer rind.

Claim 3 (original): The process of claim 2, additionally comprising exposure to thermal energy to finalize cure.

Claim 4 (original): The process of claim 1, wherein step (e) comprises exposing the foamed product to thermal energy.

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Claim 5 (original): The process of claim 1, wherein the first solution of step (a) additionally comprises an effective amount of one or more aromatic diamines.

Claim 6 (original): The process of claim 1, which comprises the following additional step:

(f) post curing the cured foamed product by exposing the cured foamed product to thermal energy, whereby the cured foamed product is post cured from the outside thereof inwardly.

Claim 7 (original): The process of claim 1, wherein the first solution of step (a) additionally comprises an effective amount of one or more catalysts.

Claim 8 (original): The process of claim 7, wherein the one or more catalysts is one or more members selected from the group consisting of amine based catalyst and metallic based catalyst.

Claim 9 (original): The process of claim 1, wherein the first solution of step (a) additionally comprises an effective amount of one or more surfactants.

Claim 10 (original): The process of claim 1, wherein the first solution of step (a) additionally comprises an effective amount of one or more fire retardants.

Claim 11 (original): The process of claim 1, wherein the one or more aromatic dianhydrides is one or more members selected from the group consisting of pyromellitic dianhydride; 3, 3', 4, 4'-bezophenone tetracarboxylic dianhydride; 4, 4'-oxydiphthalic anhydride; and 3, 3', 4, 4'-biphenyl tetracarboxylic dianhydride.

Claim 12 (original): The process of claim 1, wherein the one or more polar solvents is one or more members selected from the group consisting of N, N-dimethylformamide; N, N-dimethylacetamide; and N-methylpyrrolidinone.

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Claim 13 (original): The process of claim 1, wherein the one or more blowing agents is one or more members selected from the group consisting of water, methanol, ethanol, acetone, 2-butoxyethanol, ethyl glycol butyl ether, ethylene glycol, halogen substituted organic compound, and ether.

Claim 14 (canceled)

Claim 15 (original): The process of claim 13, wherein the ether is a member selected from the group consisting of tetrahydrofuran.

Claim 16 (original): The process of claim 1, wherein the one or more isocyanates is one or more members selected from the group consisting of monomeric organic isocyanate, polymeric organic isocyanate, and inorganic isocyanate.

Claims 17-20 (canceled)

Claim 21 (original): The process of claim 1, wherein the one or more aromatic diamines is one or more members selected from the group consisting of 4, 4' oxydianiline; 3, 4' oxydianiline; m-phenylenediamine; p-phenylenediamine; 1,3 bis(3-aminophenoxy)benzene; 4,4' diaminobenzophenone; and 4,4' diaminodiphenylsulphone.

Claims 22-24 (canceled)

Claim 25 (original): The process of claim 1, wherein the first and second solutions are thoroughly combined by stirring with a high speed mixer.

Claim 26 (original): The process of claim 6, wherein the first and second solutions are thoroughly combined by stirring with a high speed mixer.

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Claim 27 (original): The process of claim 23, wherein the first and second solutions are thoroughly combined by stirring with a high speed mixer for about 5-20 seconds.

Claim 28 (original): The process of claim 24, wherein the first and second solutions are thoroughly combined by stirring with a high speed mixer for about 5-20 seconds.

Claim 29 (original): The process of claim 25, wherein the foamed product is cured in step (e) by exposing the foamed product to microwave radiation.

Claim 30 (original): The process of claim 26, wherein the foamed product is cured in step (e) by exposing the foamed product to microwave radiation.

Claim 31 (original): The process of claim 27, wherein the foamed product is cured in step (e) by exposing the foamed product to microwave radiation.

Claim 32 (original): The process of claim 1, wherein the admixture from step (c) is allowed to foam to completion in an open container in step (d).

Claim 33 (original): The process of claim 1, wherein the admixture from step (c) is immediately transferred to a closed mold, wherein it is allowed to foam to completion in step (d), whereupon the foamed product is removed from the mold, and the foamed product is then cured by exposure to microwave radiation in step (e).

Claim 34 (original): The process of claim 1, wherein the first and second solutions are mixed in step (c) in air within a mixing chamber of a spraying system, into which mixing chamber the first and second solutions are individually fed, whereupon the resulting admixture of step (c) is sprayed by the spraying system onto the surface of an article, upon which it is allowed to foam to completion in step (d).

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Claim 35 (original): The process of claim 1, wherein the first and second solutions are mixed in step (c) in air within a high speed mixer, into which mixer the first and second solutions are individually fed, whereupon the resulting admixture of step (c) is extruded onto the surface of an article, upon which it is allowed to foam to completion in step (d).

Claim 36 (withdrawn): An aromatic polyimide foam comprising one or more aromatic dianhydrides, one or more aromatic diamines, and one or more isocyanates.

Claim 37 (withdrawn): The aromatic polyimide foam of claim 36, wherein the weight percentage of aromatic dianhydride is from about 30% to about 80%, the weight percentage of aromatic diamine is from about 0.5% to about 15%, and the weight percentage of isocyanate is from about 10% to about 50%.

Claim 38 (withdrawn): The aromatic polyimide foam of claim 36, wherein the one or more aromatic diamines is one or more members selected from the group consisting of 4, 4' oxydianiline; 3, 4' oxydianiline; m-phenylenediamine; p-phenylenediamine; 1,3 bis(3-aminophenoxy)benzene; 4,4' diaminobenzophenone; and 4,4' diaminodiphenylsulphone.

Claim 39 (withdrawn): The aromatic polyimide foam of claim 36, wherein the one or more aromatic dianhydrides is one or more members selected from the group consisting of pyromellitic dianhydride; 3, 3', 4, 4'- bezophenone tetracarboxylic dianhydride; 4, 4'- oxydiphthalic anhydride; and 3, 3', 4, 4' biphenyl tetracarboxylic dianhydride.

Claim 40 (withdrawn): The aromatic polyimide foam of claim 36, wherein the one or more isocyanates is one or more members selected from the group consisting of monomeric organic isocyanates, polymeric organic isocyanates, and inorganic isocyanates.

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Claim 41 (withdrawn): The aromatic polyimide foam of claim 36, wherein the one or more isocyanates is one or more members selected from the group consisting of Rubinate M, Rubinate TDI, toluene diisocyanate, methylene diisocyanate, Papi 94, and Papi 27.

Claim 42 (withdrawn): The aromatic polyimide foam of claim 36, having a density of from about .2 pounds/ft³ to about 20 pounds/ft³, wherein the expansion of the polyimide foam is restrained while foaming.

Claim 43 (withdrawn): The aromatic polyimide foam of claim 36, having a density of from about .2 pounds/ft³ to about 1 pounds/ft³, wherein the aromatic polyimide foam is allowed to freely expand while foaming.

Claim 44 (withdrawn): The aromatic polyimide foam of claim 36, additionally comprising one or more catalysts.

Claim 45 (withdrawn): The aromatic polyimide foam of claim 44, wherein the one or more catalysts is one or more members selected from the group consisting of amine based catalysts and metallic based catalysts.

Claim 46 (withdrawn): The aromatic polyimide foam of claim 45, wherein the amine based catalyst is selected from the group consisting of Polycat 33, Polycat 5, Polycat BL 22, Polycat LV 33, Polycat 18, Dabco 8154 and Nix A-33.

Claim 47 (withdrawn): The aromatic polyimide foam of claim 45, wherein the metallic based catalyst is selected from the group consisting of Dabco K-15.

Claim 48 (withdrawn): The aromatic polyimide foam of claim 36, additionally comprising one or more surfactants.

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Claim 49 (withdrawn): The aromatic foam of claim 48, wherein the one or more surfactants is one or more members selected from the group consisting of DC 193, DC 195, DC 197, DC 198, DC 5000, DC 5598, Niax L620 and Niax L-6900.

Claim 50 (withdrawn): The aromatic polyimide foam of claim 36, additionally comprising one or more fire retardants.

Claim 51 (withdrawn): The aromatic polyimide foam of claim 50, wherein the one or more fire retardants is one or more members selected from the group consisting of Antiblaze N, Antiblaze 80 and Vircol 82.

Claim 52 (withdrawn): The aromatic polyimide foam of claim 36, additionally comprising one or more polar solvents.

Claim 53 (withdrawn): The aromatic polyimide foam of claim 52, wherein the one or more polar solvents is one or more members selected from the group consisting of N, N-dimethylformamide; N, N-dimethylacetamide; and N-methylpyrrolidinone.

Claim 54 (withdrawn): The aromatic polyimide foam of claim 36, additionally comprising one or more blowing agents.

Claim 55 (withdrawn): The aromatic polyimide foam of claim 54, wherein the one or more blowing agents is one or more members selected from the group consisting of water, methanol, ethanol, acetone, 2-butoxyethanol, ethyl glycol butyl ether, ethylene glycol, halogen substituted organic compound, and ether.

Claim 56 (withdrawn): The aromatic polyimide foam of claim 55, wherein the halogen substituted organic compound is a member selected from the group consisting of HCFC-141-B and HFC-245FA.

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Claim 57 (withdrawn): The aromatic polyimide foam of claim 55, wherein the ether is a member selected from the group consisting of tetrahydrofuran.